

The NASA Fireball Network

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In the summer of 2008, the NASA Meteoroid Environments Office (MEO) began to establish a video fireball network, based on the following objectives:

1. Determine the speed distribution of cm size meteoroids
2. Determine the major sources of cm size meteoroids (showers/sporadic sources)
3. Characterize meteor showers (numbers, magnitudes, trajectories, orbits)
4. Determine the size at which showers dominate the meteor flux
5. Discriminate between re-entering space debris and meteors
6. Locate meteorite falls

In order to achieve the above with the limited resources available to the MEO, it was necessary that the network function almost fully autonomously, with very little required from humans in the areas of upkeep or analysis. With this in mind, the camera design and, most importantly, the ASGARD meteor detection software were adopted from the University of Western Ontario's Southern Ontario Meteor Network (SOMN), as NASA has a cooperative agreement with Western's Meteor Physics Group. 15 cameras have been built, and the network now consists of 8 operational cameras, with at least 4 more slated for deployment in calendar year 2013. The goal is to have 15 systems, distributed in two or more groups east of the Mississippi River. The cameras send their data to a central server for storage and automatic analysis; every morning, this server also automatically generates an email and a web page (<http://fireballs.ndc.nasa.gov>) containing an automated analysis of the previous night's events. This analysis provides the following for each meteor: UTC date and time, speed, start and end locations (longitude, latitude, altitude), radiant, shower identification, light curve (meteor absolute magnitude as a function of time), photometric mass, orbital elements, and Tisserand parameter. Radiant/orbital plots and various histograms (number versus speed, time, etc) are also produced. After more than four years of operation, over 5,000 multi-station fireballs have been observed, 3 of which potentially dropped meteorites. A database containing data on all these events, including the videos and calibration information, has been developed and is being modified to include data from the SOMN and other camera networks.